Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Aerospace Forces

Materials and Manufacturing Directorate

2977 P Street • Wright-Patterson Air Force Base, Ohio • 45433-7746

Composite Processing Technology

Composites used to design and build racecars today are the result of technology developed by Air Force scientists and engineers. These people, who work at the Air Force Research Laboratory Materials and Manufacturing Directorate, developed these materials for use in aerospace structures, and the technology has since been transferred for commercial uses.

Research has led to the successful development of composite parts processing methods that may reshape the way military and commercial prototypes are built. "Low Cost Composite Processing" methods, developed with industry in the 1990s, use lightweight aerospace composite materials based on resins that can be cured at temperatures much lower than those used for conventional composite materials. The result is a major reduction in the cost of applying organic matrix composites to aerospace structures by eliminating the requirement to process parts in autoclaves. Autoclave processing typically uses high temperatures and pressures, is expensive, and takes a long time. The new methods produce composite parts without the use of an autoclave, and are being used today by the automotive industry to design and build racecars. They are also being used by Lockheed Martin's "Darkstar" unmanned battlefield surveillance vehicle program.

Researchers developed advanced structural composite materials designed to be processed at temperatures as low as 60°C, as opposed to traditional materials processed at 177°C, thereby eliminating the requirement for autoclave processing and associated expensive tooling. This pioneering research with Boeing, St. Louis under the Low Cost Composite Processing program enabled a 40 percent reduction in fabrication cost for a composite aircraft wing using non-autoclave processing versus conventional processing. Expanded research in non-autoclave processing technologies could lead to the successful production of large, complex one-piece composite structures but without the size, thermal constraints and tooling costs associated with autoclaves. Based on the successful demonstration of technology that enables innovative and cost effective composites designs, research into innovative non-autoclave processes continues. This could lead to more cost-effective prototyping and save millions of dollars by making low-volume production more affordable.

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